

## CLAIMS

What is claimed is:

1. A charge pump circuit comprising:  
charge pumping capacitance;  
5 switches that vary voltage across the pumping capacitance to provide a pumped voltage output from an input voltage; and  
a clamp circuit between the input and output to prevent the output voltage from being significantly below the input voltage.
- 10 2. A charge pump circuit as claimed in claim 1 wherein the clamp comprises a transistor.
3. A charge pump circuit as claimed in claim 2 wherein the transistor is controlled by a comparator.
- 15 4. A charge pump circuit as claimed in claim 3 wherein the comparator exhibits hysteresis.
5. A charge pump circuit as claimed in claim 2 wherein the transistor is controlled by an amplifier.
- 20 6. A charge pump circuit as claimed in claim 2 wherein the transistor is a field effect transistor.
- 25 7. A gate controller comprising:  
charge pumping capacitance;  
switches that vary voltage across the pumping capacitance to provide a pumped gate control voltage from an input voltage; and

a clamp circuit between the input and output to prevent the pumped voltage from being significantly below the input voltage.

5           8.     A gate controller as claimed in claim 7 wherein the clamp comprises a transistor.

9.     A gate controller as claimed in claim 8 wherein the transistor is controlled by a comparator.

10       10.    A gate controller as claimed in claim 9 wherein the comparator exhibits hysteresis.

11.    A gate controller as claimed in claim 8 wherein the transistor is controlled by an amplifier.

15       12.    A gate controller as claimed in claim 8 wherein the transistor is a field effect transistor.

20       13.    A DC/DC converter having controlled switches comprising:  
charge pumping capacitance;  
switches that vary voltage across the pumping capacitance to provide a pumped gate control voltage to the controlled switches from an input voltage;  
and  
a clamp circuit between the input and output to prevent the pumped  
25       voltage from being significantly below the input.

14.    A DC/DC converter as claimed in claim 13 wherein the clamp comprises a transistor.

15. A DC/DC converter as claimed in claim 14 wherein the transistor is controlled by a comparator.

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16. A DC/DC converter as claimed in claim 15 wherein the comparator exhibits hysteresis.

17. A DC/DC converter as claimed in claim 14 wherein the transistor is controlled by an amplifier.

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18. A DC/DC converter as claimed in claim 14 wherein the transistor is a field effect transistor.